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July 25, 2024
Project No. M0615.25.002

Danielle Gibson
Ecology Southwest Regional Office, Toxics Cleanup Program
300 Desmond Drive SE, Lacey, WA 98503

Re: 2024 Annual Monitoring Summary Report, Former Dunlap Mound Site, Agreed Order No. DE 13124

Dear Danielle Gibson:

On June 12, 2024, Maul Foster & Alongi, Inc. (MFA), conducted a performance groundwater monitoring event on behalf of the Port of Tacoma (the Port) at the former Dunlap Mound Site (Facility Site ID 1219; Cleanup Site ID 3635), located at 3009 Taylor Way, Tacoma, Washington (the Site) (Figure 1). Groundwater monitoring activities were conducted consistent with the requirements set forth in Agreed Order No. DE 13124 between the Port and the Washington State Department of Ecology (Ecology) and in compliance with the *Draft Cleanup Action Plan* prepared by Dalton, Olmstead & Fuglevand (DOF) (DOF 2015b). The field activities and analytical results of the monitoring events are discussed below.

Site Background

The Site, also known as the former Arkema Mound, is approximately 15 acres and is located at 3009 Taylor Way, Tacoma, Washington. The Site is immediately south of the former Arkema manufacturing site (Facility Site ID 1220), which is located along a portion of the Hylebos Waterway at 2901 Taylor Way. The Site was operated as a log sort yard in the 1980s by Dunlap Towing Company and Echo Lumber Company. Arkema Inc., owned the Site during its sort yard operations. The Port purchased the Site in 2007 and currently leases it to a tenant for vehicle storage.

Slag from the Asarco, Inc., smelter was placed at the Site as road base for the unpaved sort yard. Asarco slag contains elevated levels of arsenic, copper, lead, and zinc, which were released into the environment. Between the early 1990s and 2015, several interim remedial actions were completed at the Site under Consent Decree No. 92-2-11351-7 and later Agreed Order No. 6129 with Ecology (DOF 2015b). Following completion of the interim actions, a remedial investigation report was finalized in September 2015 (DOF 2015a). The remedial investigation report concluded that the completed interim actions reduced metal concentrations in Site soils, and that all migration pathways, except for groundwater to surface water, were controlled. In 2016, the Port entered Agreed Order No. DE 13124 with Ecology that required performance/confirmation groundwater monitoring and the preparation of an environmental covenant for the Site. The primary objective of the performance/confirmation groundwater monitoring is to evaluate dissolved arsenic concentrations in the upper aquifer where groundwater discharges to surface water in two areas of the Site: along the Hylebos shoreline in the northeast area and along the western/southern Site boundary at the head of the Kaiser Ditch (DOF 2021).

Three monitoring wells (MW-H[R], MW-E[R], and MW-1[R]) were installed at the Site in November 2016 (Figure 2). Performance/confirmation groundwater monitoring began in January 2017, with quarterly groundwater monitoring events completed until December 2020 in general accordance

with the performance/confirmation groundwater monitoring plan (DOF 2015b, 2021). Following agreement with Ecology, monitoring was discontinued at MW-1(R) in October 2018 (DOF 2021).

Following completion of the 2020 annual monitoring event, The Port requested a modification to the sampling frequency of 18 months due to stable or decreasing trends of total and dissolved arsenic concentrations in groundwater (DOF 2021). On March 1, 2022, Ecology approved a modification to the groundwater monitoring program to continue on a six-month frequency (Ecology 2022a). Monitoring activities were performed in June and December 2022. Following the results of these monitoring events that showed decreasing trends of total and dissolved arsenic concentrations in both monitoring wells at the Site (MFA 2023), Ecology approved a reduction in the groundwater sampling schedule from a 6-month frequency to an 18-month frequency in an email on July 11, 2023 (Ecology 2023).

Field Procedures

MFA performed a groundwater monitoring event at the Site on June 12, 2024. Groundwater samples were collected from MW-H(R) and MW-E(R) at the Site using low-flow sampling procedures during falling/outgoing lower tidal levels when groundwater is inferred to flow towards Hylebos Waterway. The groundwater level in each well was measured prior to sampling and is presented in Table 1. During purging, MFA recorded flow rates, water levels, and water-quality field parameters (pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential, and turbidity) on field sampling data sheets (Attachment A). Ferrous iron was measured using a Hach Model IR-18C field kit during the final readings of field parameters. The final field parameters are presented in Table 2.

During the monitoring event, water-quality field parameters were monitored. At monitoring well MW-H(R), water-quality field parameters stabilized before the sample was collected; a field duplicate was collected at monitoring well MW-H(R). However, at monitoring well MW-E(R), significant drawdown was observed during low-flow purging (see Attachment A), similar to previous monitoring events (MFA 2023). MFA measured an initial depth to water in monitoring well MW-E(R) of 7.21 feet below top of column (TOC). After six minutes of purging, the depth to water was measured at 8.60 feet below TOC, resulting in a water column of only 1.31 feet. Purging was paused and the well was allowed some time to recharge, final field parameters were collected, and a sample was collected for analysis from the remaining water column. Sufficient sample volume was collected before the well went dry.

Based on dissolved arsenic concentrations historically exceeding the value of total arsenic concentrations, the sample collection procedure was modified for the December 2022 monitoring event and the modified procedure was followed for the June 2024 monitoring event (MFA 2023). Groundwater for both total and dissolved analyses was first collected into an unpreserved polyethylene container and homogenized in the field to reduce the potential for non-homogenous sample collection. Groundwater samples for dissolved arsenic analysis were withdrawn from the unpreserved container, field filtered with a 0.45-micron filter, and placed into a laboratory-provided nitric-acid-preserved container. Groundwater samples for total metals analysis were transferred directly into a nitric-acid-preserved container from the unpreserved container.

All samples were immediately placed in a cooler on ice and submitted to Ecology-accredited Apex Laboratories, LLC, in Tigard, Oregon, for laboratory analysis under standard chain-of-custody procedures. Groundwater samples were analyzed for total and dissolved arsenic by U.S. Environmental Protection Agency Method 200.8.

Groundwater Monitoring Results

The laboratory analytical report is provided in Attachment B, and June 2024 analytical data is included in Table 3 along with historical data. Groundwater data is screened against the groundwater cleanup level (CUL) of 8 ug/L, which is the natural background concentration of arsenic in groundwater for the Puget Sound basin (Ecology 2022b).[1]

Analytical data and the laboratory's internal quality assurance and quality control data were reviewed to assess whether they met project-specific data quality objectives. A data validation memorandum summarizing data evaluation procedures, data usability, and deviations from specific field and/or laboratory methods is included as Attachment C. The data are considered acceptable for their intended use. A Mann-Kendall trend analysis[2] was completed to evaluate concentration trends since compliance/performance monitoring began in 2017 (see Attachment D). Groundwater data from the June 2024 monitoring event will be submitted to Ecology's Environmental Information Management System database within 30 days of completion of data validation.

Historically at the Site, dissolved arsenic concentrations are often higher than the associated total arsenic concentrations for each sample (DOF 2021, MFA 2023). It is possible that the brackish matrix caused by tidal influence on groundwater at the Site introduces matrix interference that influences total and/or dissolved analyses. The tidal influence on the groundwater may cause arsenic to decrease in solubility and precipitate with iron and other oxides (DOF 2015a); ferrous iron has been monitored as a field parameter in the two monitoring wells since 2017 and results have ranged from 2.2 milligrams per liter (mg/L) to 7.0 mg/L (see Table 2). Field sample collection procedures were modified to reduce the potential for non-homogenous sample collection, as described in the Field Procedures section above, and laboratory matrix interference-reducing technologies were implemented to address these potential influences on the data. The laboratory analyzed samples by EPA Method 200.8 using a triple quadrupole (QQQ) inductively coupled plasma mass spectrometry (ICP-MS) instrument which utilizes technologies that reduce spectral and isobaric interferences that are often present in brackish samples, as those routinely encountered at the Site.

These procedures appear to have reduced variability of dissolved and total arsenic concentrations. The total arsenic concentration at MW-H(R) was greater than the dissolved arsenic concentration in the same sample; similar results were observed in the field duplicate collected from MW-H(R). The total arsenic concentration at MW-E(R) was slightly less than the dissolved arsenic concentration in the same sample, but the total and dissolved results had a relative percent difference of less than one percent (see Attachment C) and is therefore considered acceptable for use. The monitoring event results indicate that arsenic is present in groundwater primarily in the dissolved form.

Monitoring Well MW-H(R)

Dissolved arsenic was detected in groundwater from MW-H(R) at a concentration of 16.3 ug/L, which exceeds the CUL of 8 ug/L. A similar result was observed for total arsenic with a groundwater concentration of 16.7 ug/L. The field duplicate collected from MW-H(R) had similar results, with a dissolved arsenic concentration of 16.4 ug/L and a total arsenic concentration of 17.4 ug/L.

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[1] The *Draft Cleanup Action Plan* (DOF 2015b) identified the arsenic CUL for groundwater as 5 ug/L, which was an adjustment of potential CULs up to the natural background concentration for Washington State (WAC 173-340-900, Table 720-1). In 2022, Ecology published a study of arsenic background concentrations in groundwater throughout Washington State, identifying 8 ug/L as the natural background concentration for the Puget Sound Basin.

[2] Using a toolkit developed by GSI Environmental, Inc.,

Plots depicting dissolved and total arsenic concentrations at MW-H(R) are presented in Figure 3. The Mann-Kendall trend analysis shows a decreasing trend for dissolved and total arsenic concentrations in monitoring well MW-H(R) since monitoring began in 2017 (Attachment D).

Monitoring Well MW-E(R)

Dissolved arsenic was detected in groundwater from MW-E(R) at a concentration of 21.2 ug/L, which exceeds the CUL of 8 ug/L. A similar result was observed for total arsenic with a groundwater concentration of 21.0 ug/L.

Plots depicting dissolved and total arsenic concentrations at MW-E(R) are presented in Figure 4. The Mann-Kendall trend analysis shows a stable trend for dissolved arsenic concentrations and a decreasing trend for total arsenic concentrations in monitoring well MW-E(R) since monitoring began in 2017 (Attachment D).

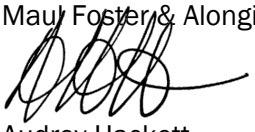
Discussion

Based on the laboratory results and Mann-Kendall trend analysis following completion of the June 2024 groundwater monitoring events, total and dissolved arsenic concentrations are likely stable or decreasing in both monitoring wells at the Site. Therefore, it is recommended that monitoring at the Site continue at the 18-month interval with the next event scheduled for December 2025.

Please contact Audrey Hackett at (206) 556-2015 if you have any questions related to the groundwater monitoring activities or results presented above.

Sincerely,

Maul Foster & Alongi, Inc.



Audrey Hackett
Senior Environmental Scientist

Fiona Bellows
Project Chemist

Attachments

References

Limitations

Figures

Tables

A—Water Field Sampling Data Sheets

B—Analytical Laboratory Report

C—Data Validation Memorandum

D—Mann-Kendall Trend Analysis and Plots

cc:
Scott Hooton, Port of Tacoma
Jerome Lambiotte, Washington State Department of Ecology

References

DOF. 2015a. *Remedial Investigation, Former Arkema Mound Site, 3009 Taylor Way, Tacoma, Washington*. Prepared for Port of Tacoma. Dalton, Olmsted & Fuglevand. September.

DOF. 2015b. *Draft Cleanup Action Plan, Former Arkema Mound Site*. Prepared for Port of Tacoma. Dalton, Olmsted & Fuglevand. November 20.

DOF. 2021. David Cooper, Dalton, Olmsted & Fuglevand. *2020 Annual Monitoring Summary Report, Former Dunlap Mound*. Memorandum to Mohsen Kourehdar, Washington State Department of Ecology. May 5.

Ecology. 2022a. Andrew Smith, Washington State Department of Ecology. *Former Dunlap Mound*. Email to Scott Hooton, Port of Tacoma. March 1.

Ecology. 2022b. *Natural Background Groundwater Arsenic Concentrations in Washington State.* Washington State Department of Ecology, Toxics Cleanup Program: Olympia, WA. January.

Ecology. 2023. Andrew Smith, Washington State Department of Ecology. *RE: Looking for 2022 Annual Monitoring Summary Report - FSID 1219*. Email to Scott Hooton, Port of Tacoma. July 11.

MFA. 2023. Audrey Hackett, Maul Foster & Alongi, Inc. *2022 Annual Monitoring Summary Report.* Memorandum to Scott Hooton, Port of Tacoma. February 3.

Limitations

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

Figures

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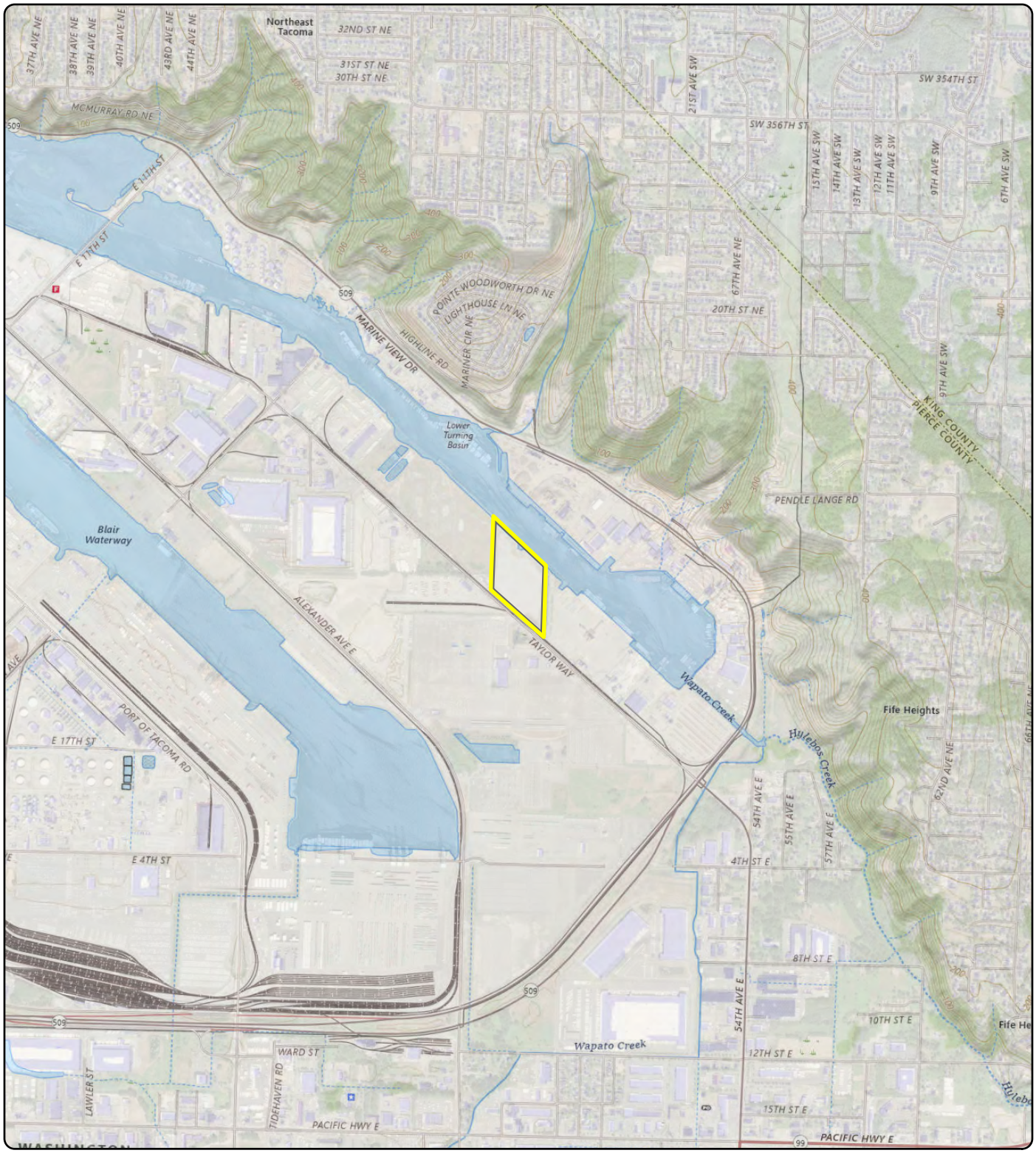

Notes
U.S. Geological Survey 7.5-minute topographic quadrangles: Tacoma North and Poverty Bay. Township 21 north, range 3 east, sections 35, 36.

Data Source
Site location obtained from Exhibit A Agreed Order No. DE 13124.

Legend

Site Location

Figure 1
Site Location

Former Dunlap Mound Site
3009 Taylor Way
Tacoma, WA

0 2,000
Feet

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Path: X:\0_MFA_Projects\M0615.25\001\Pro\M0615_25_001.aprx
Print Date: 7/18/2024
Reviewed By: ahackett
Produced By: jroberts
Project: M0615.25.001

Figure 2
Site Monitoring Well Locations

Former Dunlap Mound Site
3009 Taylor Way
Tacoma, WA

Legend

- Monitoring Well
- Site Boundary
- Tax Lot

0 200
Feet

Data Sources
Aerial photograph obtained from Google; site boundary obtained from Exhibit A Agreed Order No. DE 13124.

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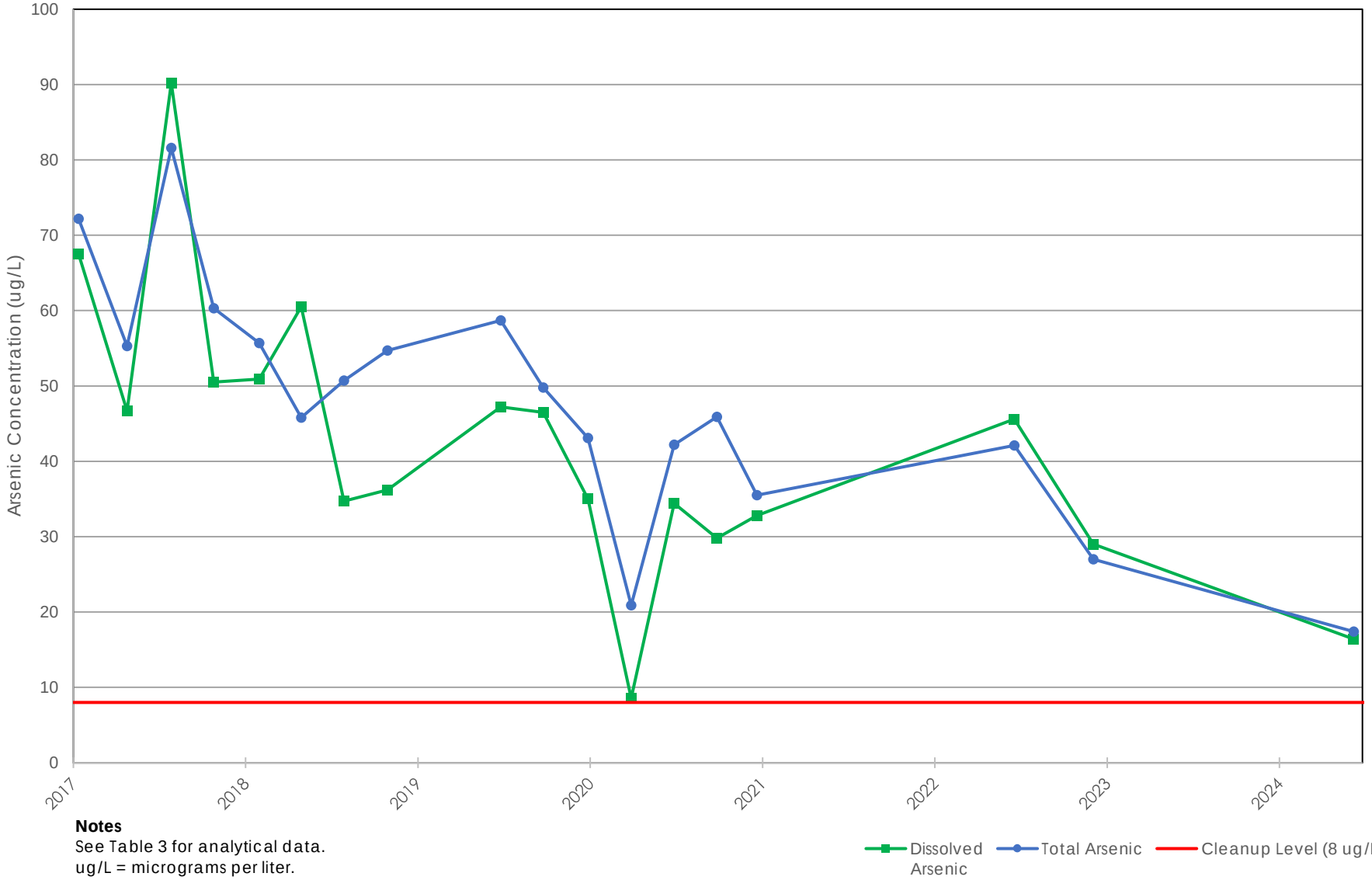
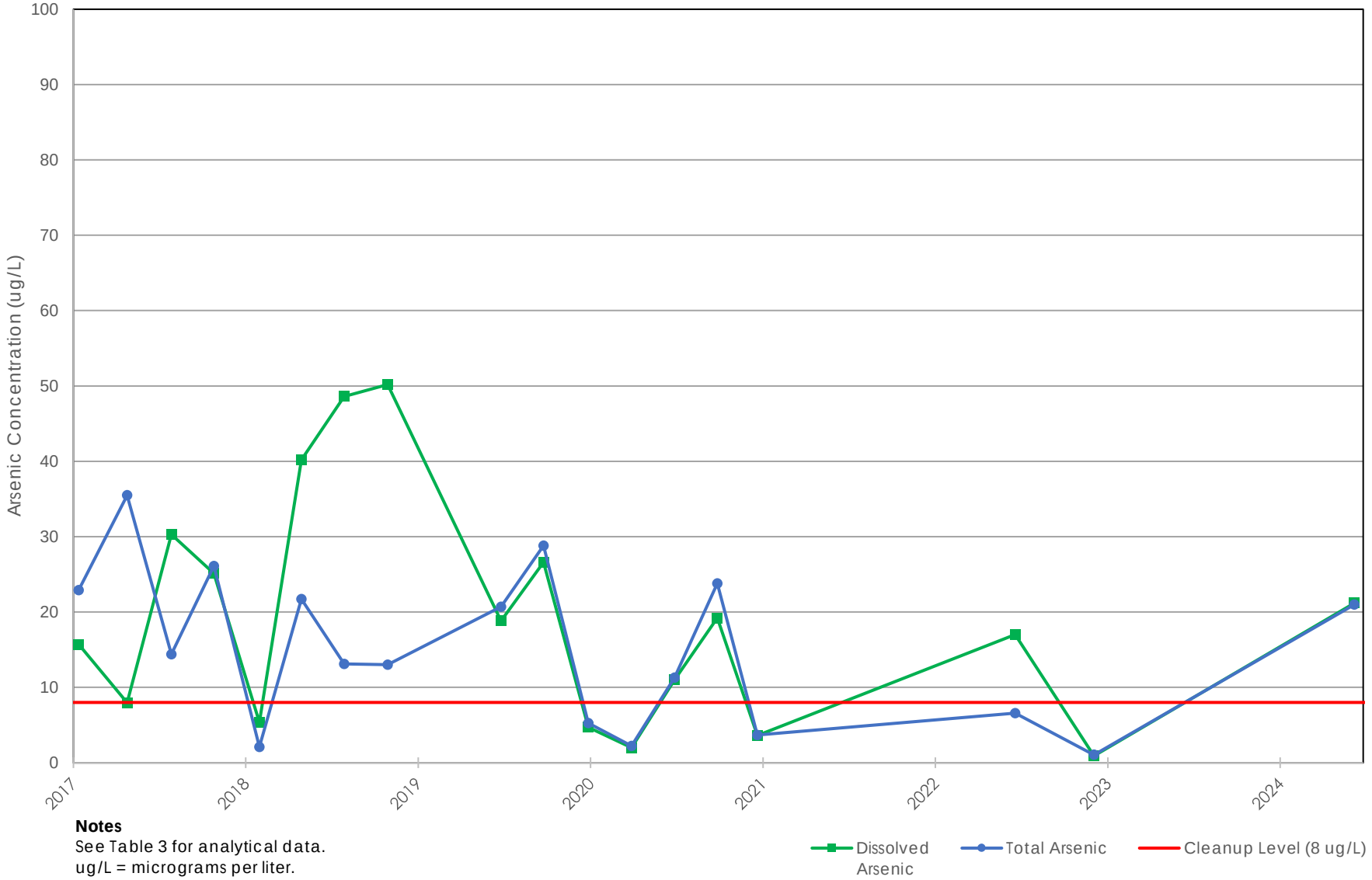
Figure 3
MW-H(R) Trend Plot
Former Dunlap Mound Site
Tacoma, Washington



Notes
See Table 3 for analytical data.
ug/L = micrograms per liter.

Figure 4
MW-E(R) Trend Plot
Former Dunlap Mound Site
Tacoma, Washington



Notes
See Table 3 for analytical data.
ug/L = micrograms per liter.

Tables

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Table 1
Summary of Groundwater Water Levels
Former Dunlap Mound Site
Port of Tacoma

Location	Elevation of Top of Casing (ft MLLW)	Well Depth (ft below TOC)	Date	Water Level (ft below TOC)	Water Level Elevation (ft MLLW)
MW-1(R)	15.95	10.2	01/12/2017	2.6	13.35
			04/25/2017	1.81	14.14
			07/28/2017	4.36	11.59
			10/26/2017	2.71	13.24
			01/31/2018	1.55	14.40
			04/30/2018	2.8	13.15
			07/30/2018	4.81	11.14
			10/30/2018	3.02	12.93
MW-E(R)	16.53	10.0	01/12/2017	6.53	10.00
			04/25/2017	6.15	10.38
			07/28/2017	7.37	9.16
			10/26/2017	7	9.53
			01/31/2018	4.75	11.78
			04/30/2018	6.65	9.88
			07/30/2018	7.7	8.83
			10/30/2018	7.35	9.18
			06/28/2019	7.74	8.79
			09/26/2019	7.7	8.83
			12/30/2019	5.28	11.25
			03/31/2020	6.18	10.35
			06/30/2020	7.51	9.02
			09/29/2020	7.6	8.93
			12/23/2020	4.9	11.63
			06/23/2022	6.96	9.57
			12/07/2022	5.44	11.09
			06/12/2024	7.21	9.32

Table 1
Summary of Groundwater Water Levels
Former Dunlap Mound Site
Port of Tacoma

Location	Elevation of Top of Casing (ft MLLW)	Well Depth (ft below TOC)	Date	Water Level (ft below TOC)	Water Level Elevation (ft MLLW)
MW-H (R)	18.96	13.1	01/12/2017	7.15	11.81
			04/25/2017	7.20	11.76
			07/28/2017	7.36	11.60
			10/26/2017	7.85	11.11
			01/31/2018	7.09	11.87
			04/30/2018	7.62	11.34
			07/30/2018	8.11	10.85
			10/30/2018	7.25	11.71
			06/28/2019	8.09	10.87
			09/26/2019	7.9	11.06
			12/30/2019	7.21	11.75
			03/31/2020	7.22	11.74
			06/30/2020	7.48	11.48
			09/29/2020	7.81	11.15
			12/23/2020	7.21	11.75
			06/23/2022	7.63	11.33
			12/07/2022	7.32	11.64
			06/12/2024	7.90	11.06

Notes

2017–2020 water levels are provided by DOF.[(1)]

DOF = Dalton, Olmsted & Fuglevand, Inc.

ft = feet.

MLLW = mean lower low water.

TOC = top of casing.

Reference

[(1)]DOF. 2021. David Cooper, Dalton, Olmsted & Fuglevand, Inc. *2020 Annual Monitoring Summary Report, Former Dunlap Mound*. Table 1. Memorandum to M. Kourehdar, Washington State Department of Ecology. May 5.

Table 2
Summary of Field Parameter Results
Former Dunlap Mound Site
Port of Tacoma

Location	Date	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	ORP (mV)	pH (SU)	Temperature (°C)	Turbidity (NTU)
MW-1(R)	01/12/2017	828	0.3	4.5	-12.9	6.7	10.6	73.1
	04/25/2017	853	0.1	2.8	-1.3	6.7	11.7	51.2
	07/28/2017	1,010	0.9	4.0	-26.3	6.4	17.2	4.0
	10/26/2017	834	0.7	6.9	-8.9	6.7	15.0	5.6
	01/31/2018	1,176	0.4	2.8	-34.3	6.7	9.3	43.5
	04/30/2018	1,130	0.1	2.8	-42.3	6.5	11.3	31.2
	07/30/2018	1,220	0.1	3.0	-99.5	6.7	15.5	11.0
	10/30/2018	1,033	1.1	4.0	44.8	6.5	15.1	6.8
MW-E(R)	01/12/2017	1,261	0.4	4.5	-57.0	6.4	12.5	60.5
	04/25/2017	646	0.3	5.5	17.2	6.7	10.3	45.6
	07/28/2017	2,216	1.0	6.5	-13.9	6.2	17.8	2.6
	10/26/2017	1,845	0.4	3.7	-30.7	6.4	16.3	6.2
	01/31/2018	612	0.3	2.8	-10.9	6.4	10.0	4.8
	04/30/2018	1,143	1.8	2.2	-86.5	6.4	10.0	12.2
	07/30/2018	2,855	0.4	4.0	-90.2	6.6	17.4	15.7
	10/30/2018	2,404	2.5	2.8	11.2	6.5	16.2	14.9
	06/28/2019	2,837	0.7	4.5	-116.5	6.7	14.3	5.9
	09/26/2019	2,226	0.4	3.2	-92.8	6.2	10.3	18.3
	12/30/2019	595	1.3	2.8	-54.6	6.1	12.0	12.4
	03/31/2020	1,865	3.0	3.6	-88.5	6.2	10.4	3.8
	06/30/2020	2,347	1.4	4.5	-3.4	6.5	13.4	8.3
	09/29/2020	2,445	1.9	6.8	27.3	6.5	17.5	10.3
	12/23/2020	745	1.5	3.5	33.9	6.9	12.8	11.2
	06/23/2022	2,496	2.85	5.5	166	6.34	13.3	29.2
	12/07/2022	596.3	9.4	2.5	-2.6	6.33	12.0	3.08
	06/12/2024	1,550	0.51	5.0	-79.9	6.37	14.4	8.57

Table 2
Summary of Field Parameter Results
Former Dunlap Mound Site
Port of Tacoma

Location	Date	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	ORP (mV)	pH (SU)	Temperature (°C)	Turbidity (NTU)
MW-H (R)	01/12/2017	13,538	0.5	5.0	18.1	6.4	11.5	12.1
	04/25/2017	9,242	0.6	4.3	-0.2	6.5	11.5	14.6
	07/28/2017	11,311	1.4	6.0	-20.1	6.1	18.6	4.3
	10/26/2017	23,373	0.4	5.8	15.8	6.0	16.1	21.8
	01/31/2018	12,883	2.1	2.2	-28.2	6.4	10.1	4.6
	04/30/2018	8,460	1.5	3.5	-56.8	6.4	11.1	34.9
	07/30/2018	17,211	0.8	6.5	-32.2	6.4	17.4	6.5
	10/30/2018	25,604	0.3	4.5	22.7	6.3	16.2	42.9
	06/28/2019	13,618	2.7	6.0	-51.2	6.3	14.9	25.4
	09/26/2019	24,364	0.5	5.6	2.2	6.0	17.4	24.3
	12/30/2019	13,905	0.3	6.0	-22.1	5.9	12.6	32.1
	03/31/2020	16,572	0.4	7.0	-31.6	6.1	10.9	46.2
	06/30/2020	9,933	1.5	3.8	115.7	6.2	13.8	12.3
	09/29/2020	20,611	1.1	7.0	85.2	6.4	17.0	44.4
	12/23/2020	9,875	1.2	6.5	18.4	5.9	12.1	24.7
	06/23/2022	7,332	0.89	4.2	67.4	6.51	17.3	66.0
	12/07/2022	12,605	3.5	6.0	-16.0	6.24	12.7	1.40
	06/12/2024	5,809	0.44	5.0	16.7	6.59	13.7	3.70

Table 2
Summary of Field Parameter Results
Former Dunlap Mound Site
Port of Tacoma

Notes

2017–2020 field parameters are provided by DOF[(1)].

°C = degrees Celsius.

DOF = Dalton, Olmsted & Fuglevand, Inc.

mg/L = milligrams per liter.

mV = millivolt.

NTU = nephelometric turbidity unit.

ORP = oxidation reduction potential.

SU = standard units.

uS/cm = microsiemens per centimeter.

Reference

[(1)]DOF. 2021. David Cooper, Dalton, Olmsted & Fuglevand, Inc. *2020 Annual Monitoring Summary Report, Former Dunlap Mound* . Table 1. Memorandum to M. Kourehdar, Washington State Department of Ecology. May 5.

Table 3
Summary of Groundwater Analytical Results
Former Dunlap Mound Site
Port of Tacoma

Location	Collection Date	Sample Type	Dissolved Metals (ug/L)			Total Metals (ug/L)		
			Arsenic	Copper	Zinc	Arsenic	Copper	Zinc
CUL:[(a)(1)]			8	3.1	81	NV	NV	NV
MW-1(R)	01/12/2017	N	0.956 D	--	--	0.954	--	--
	04/25/2017	N	0.399 D	--	--	0.404	--	--
	07/28/2017	N	4.03	--	--	1.46	--	--
	10/26/2017	N	0.825	--	--	2.32	--	--
	01/31/2018	N	0.349	--	--	0.682	--	--
	04/30/2018	N	0.247	--	--	0.391	--	--
	07/30/2018	N	1.70	--	--	0.375	--	--
	10/30/2018	N	0.344	--	--	0.328	--	--
MW-E(R)	01/12/2017	N	15.7 D	--	--	22.9	--	--
	04/25/2017	N	7.96 D	--	--	35.5	--	--
	07/28/2017	N	30.3	--	--	14.4	--	--
	10/26/2017	N	25.1	--	--	26.1 D	--	--
	01/31/2018	N	5.36	--	--	2.07	--	--
	04/30/2018	N	40.2 D	--	--	21.7	--	--
	07/30/2018	N	48.6	--	--	13.1	--	--
	10/30/2018	N	50.2	--	--	13.0	--	--
	06/28/2019	N	18.8	--	--	20.7	--	--
	09/26/2019	N	26.6	--	--	28.8	--	--
	12/30/2019	N	4.69	--	--	5.24	--	--
	03/31/2020	N	2.00 D	--	--	2.21	--	--
	06/30/2020	N	11.0 D	--	--	11.3 D	--	--
	09/29/2020	N	19.2 D	--	--	23.8 D	--	--
	12/23/2020	N	3.61 D	--	--	3.67 D	--	--
	06/23/2022	N	17.0 J	--	--	6.56 J	--	--
	12/07/2022	N	0.92	--	--	1.06	--	--
	06/12/2024	N	21.2	--	--	21.0	--	--
MW-H(R)	01/12/2017	N	67.5 D	2.5 U	20 U	72.2	2.5 U	20 U
	04/25/2017	N	46.7 D	2.5 U	20 U	55.3	2.5 U	20 U
	07/28/2017	N	90.2 D	--	--	81.6 D	--	--
	10/26/2017	N	50.5 D	--	--	60.3 D	--	--
	01/31/2018	N	50.9 D	--	--	55.7 D	--	--
	04/30/2018	N	60.5 D	--	--	45.8 D	--	--
	07/30/2018	N	34.7 D	--	--	50.7 D	--	--
	10/30/2018	N	36.2 D	--	--	54.7 D	--	--
	06/28/2019	N	47.2 D	--	--	57.5 D	--	--
	06/28/2019	FD	45.8	--	--	58.7	--	--
	09/26/2019	N	46.4 D	--	--	48.1 D	--	--

Table 3
Summary of Groundwater Analytical Results
Former Dunlap Mound Site
Port of Tacoma

Location	Collection Date	Sample Type	Dissolved Metals (ug/L)			Total Metals (ug/L)		
			Arsenic	Copper	Zinc	Arsenic	Copper	Zinc
CUL:[a][1]			8	3.1	81	NV	NV	NV
	09/26/2019	FD	46.5	--	--	49.8	--	--
	12/30/2019	N	34.7 D	--	--	41.3 D	--	--
MW-H(R) (cont.)	12/30/2019	FD	35.0	--	--	43.1	--	--
	03/31/2020	N	7.51 D	--	--	20.9 D	--	--
	03/31/2020	FD	8.58	--	--	20.4	--	--
	06/30/2020	N	32.9 D	--	--	40.7 D	--	--
	06/30/2020	FD	34.4	--	--	42.2	--	--
	09/29/2020	N	26.5 D	--	--	45.9 D	--	--
	09/29/2020	FD	29.8	--	--	42.0	--	--
	12/23/2020	N	32.8 D	--	--	35.5 D	--	--
	12/23/2020	FD	31.7	--	--	34.8	--	--
	06/23/2022	N	45.6	--	--	42.1	--	--
	06/23/2022	FD	44.5	--	--	41.8	--	--
	12/07/2022	N	26.6	--	--	26.4	--	--
	12/07/2022	FD	29.0	--	--	27.0	--	--
	06/12/2024	N	16.3	--	--	16.7	--	--
	06/12/2024	FD	16.4	--	--	17.4	--	--

Notes

2017–2020 analytical results are provided by DOF.

Gray shading indicates values that exceed project cleanup levels; non-detects (U) were not compared with CULs.

-- = not analyzed.

CUL = cleanup level.

D = the reported value is from a dilution.

DOF = Dalton, Olmsted & Fuglevand, Inc.

FD = field duplicate sample.

J = result is estimated.

N = normal environmental sample.

NV = no value.

U = result is non-detect at the detection limit.

ug/L = micrograms per liter.

[a]In 2024, the arsenic CUL was updated from 5 ug/L, as presented in the 2015 draft cleanup action plan, to 8 ug/L based on the natural background concentration of arsenic in groundwater in the Puget Sound basin.

Reference

[1]Ecology. 2022. *Natural Background Groundwater Arsenic Concentrations in Washington State.* Publication No. 14-09-044. Washington State Department of Ecology, Toxics Cleanup Program: Olympia, WA. January.

Attachment A

Water Field Sampling Data Sheets

MAUL FOSTER ALONGI

Groundwater Field Sampling Data Sheet

MAUL FOSTER ALONGI

Project Information

Project No.	Client Name	Project Name	Sampling Event	Sampler(s)
M0615.25.002	Port of Tacoma	Former Dunlap Mound	2024 GW Monitoring	F. Bellows

Well Information

Location ID	Well Type	Monument Type	Depth Measuring Point	Well Diameter (in)	Screen Interval (ft)	Sample Depth (ft)
MW-E(R)	Monitoring	Flush-mount	Top of Casing	2.0	5-10	9.5

Hydrology/Level Measurements

Date	Time	Depth to Bottom (ft)	Depth to Product (ft)	Depth to Water (ft)	Product Thickness (ft)	Water Column (ft)	Well Casing Volume (gal)	
		DTB	*DTP*	*DTW*	*DTP - DTW*	*DTB - DTW*	*(gal/ft x water column)*	*0.75" = 0.023 gal/ft* *1" = 0.041 gal/ft* *1.5" = 0.092 gal/ft* *2" = 0.163 gal/ft* *3" = 0.367 gal/ft* *4" = 0.653 gal/ft* *6" = 1.469 gal/ft* *8" = 2.611 gal/ft*
06/12/2024	9:55	9.91	NA	7.21	NA	2.70	0.44	

Water Quality Data

Purge Method	Peristaltic Pump	*Purge/Sampling Methods: peristaltic pump, submersible pump, vacuum pump, inertia pump, dedicated pump, disposable bailer, other*						
Purge Start Time	10:07	*ideally < 0.3 ft drawdown*	*± 0.1*	*± 3%*	*± 3%*	*± 10% if > 0.5*	*± 10*	*< 5 or ± 10% if > 5*

Time	Cumulative Purge Volume	Flowrate	Water Level	pH	Temperature	Conductivity	Dissolved Oxygen	ORP	Turbidity
	gal	*L/min*	*ft*	*SU*	*degrees C*	*uS/cm*	*mg/L*	*mV*	*NTU*
10:10	0.1	0.1	8.08	6.38	12.8	1,890	0.37	-68.9	5.05
10:13	0.2	0.1	8.60	6.39	12.7	1,770	0.30	-70.8	5.13
10:36	0.3	0.1	8.85	6.39	13.3	1,635	0.64	-80.9	6.49
10:42	0.4	0.1	9.20	6.37	14.4	1,550	0.51	-79.9	8.57

Last row of water quality data are considered final field parameters unless otherwise noted.

Water Quality Observations *(clarity, tint, odor, sheen, etc.)*: Pale yellow, clear, no odor, no sheen.

General Comments

- Ferrous iron = 5.0 mg/L
- Pause at 10:15 to allow recharge, water level at 8.80 ft. Resume at 10:35, water level at 8.65 ft. Discontinued parameter collection at 10:42 to collect sample. Well went dry during sampling.
- Filled 600 mL into 1L poly and homogenized prior to splitting to total/dissolved polys.

Sample Information

Sampling Method	Peristaltic Pump		
Sample Name	MW-E(R)-061224		
Sample Date	06/12/2024	**Sample Time**	11:05

Container Type	Preservative	Filtered (Y/N)	No. Containers
Poly	HNO3	Y	1
Poly	HNO3	N	1
		Total No. Containers:	2

Groundwater Field Sampling Data Sheet

MAUL FOSTER ALONGI

Project Information

Project No.	Client Name	Project Name	Sampling Event	Sampler(s)
M0615.25.002	Port of Tacoma	Former Dunlap Mound	2024 GW Monitoring	F. Bellows

Well Information

Location ID	Well Type	Monument Type	Depth Measuring Point	Well Diameter (in)	Screen Interval (ft)	Sample Depth (ft)
MW-H(R)	Monitoring	Flush-mount	Top of Casing	2.0	8-13	10.0

Hydrology/Level Measurements

Date	Time	Depth to Bottom (ft)	Depth to Product (ft)	Depth to Water (ft)	Product Thickness (ft)	Water Column (ft)	Well Casing Volume (gal)
		DTB	*DTP*	*DTW*	*DTP - DTW*	*DTB - DTW*	*(gal/ft x water column)*
06/12/2024	12:07	13.10	NA	7.90	NA	5.20	0.85

0.75" = 0.023 gal/ft
1" = 0.041 gal/ft
1.5" = 0.092 gal/ft
2" = 0.163 gal/ft
3" = 0.367 gal/ft
4" = 0.653 gal/ft
6" = 1.469 gal/ft
8" = 2.611 gal/ft

Water Quality Data

Purge Method	Peristaltic Pump	*Purge/Sampling Methods: peristaltic pump, submersible pump, vacuum pump, inertia pump, dedicated pump, disposable bailer, other*						
Purge Start Time	12:15	*ideally < 0.3 ft drawdown*	*± 0.1*	*± 3%*	*± 3%*	*± 10% if > 0.5*	*± 10*	*< 5 or ± 10% if > 5*

Time	Cumulative Purge Volume	Flowrate	Water Level	pH	Temperature	Conductivity	Dissolved Oxygen	ORP	Turbidity
	gal	*L/min*	*ft*	*SU*	*degrees C*	*uS/cm*	*mg/L*	*mV*	*NTU*
12:17	0.1	0.2	8.80	6.40	13.0	8,180	0.78	159.4	136
12:22	0.3	0.1	8.65	6.42	13.5	NM	1.03	124.3	88.5
12:27	0.5	0.1	8.55	6.49	13.9	7,436	0.88	75.4	38.5
12:32	0.7	0.1	8.50	6.53	13.9	6,796	0.56	47.7	15.9
12:35	0.8	0.1	8.50	6.56	14.0	6,404	0.47	34.3	9.42
12:38	0.9	0.1	8.50	6.58	14.0	6,135	0.46	25.3	6.10
12:41	1.0	0.1	8.52	6.60	13.8	5,858	0.43	18.4	4.59
12:44	1.1	0.1	8.54	6.59	13.7	5,809	0.44	16.7	3.70

Last row of water quality data are considered final field parameters unless otherwise noted.

Water Quality Observations *(clarity, tint, odor, sheen, etc.)*

Orange flecks at first flush.
After purge: clear, no color, no odor, no sheen.

Sample Information

Sampling Method	Peristaltic Pump		
Sample Name	MW-H(R)-061224		
Sample Date	06/12/2024	Sample Time	12:55

Container Type	Preservative	Filtered (Y/N)	No. Containers
Poly	HNO3	Y	1
Poly	HNO3	N	1
		Total No. Containers:	2

General Comments

- Ferrous iron = 5.0 mg/L
- Conductivity erroneously not measured at 12:22.
- Field duplicate collected here: MW-DUP-061224.
- Filled 800 mL into 1L poly and homogenized prior to splitting to total/dissolved polys. Same procedure for field duplicate using separate poly and filter.

Attachment B

Analytical Laboratory Report

MAUL
FOSTER
ALONGI

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Friday, June 28, 2024

Audrey Hackett
Maul Foster & Alongi, INC.
3140 NE Broadway Street
Portland, OR 97232

RE: A4F1203 - Former Dunlap Mound - M0615.25.002

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A4F1203, which was received by the laboratory on 6/13/2024 at 11:11:00AM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: pnerenberg@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample receipt, unless prior arrangements have been made.

Cooler Receipt Information
Acceptable Receipt Temperature is less than, or equal to, 6 degC (not frozen), or received on ice the same day as sampling.
(See Cooler Receipt Form for details)
Default Cooler 4.1 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

The results in this report apply to the samples analyzed in accordance with the chain of custody document(s) and updated by any subsequent written communications. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-E(R)-061224	A4F1203-01	Water	06/12/24 11:05	06/13/24 11:11
MW-H(R)-061224	A4F1203-02	Water	06/12/24 12:55	06/13/24 11:11
MW-DUP-061224	A4F1203-03	Water	06/12/24 12:55	06/13/24 11:11

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 200.8 (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-E(R)-061224 (A4F1203-01)				**Matrix: Water**				
Batch: 24F0813								
Arsenic	**21.0**	---	1.80	ug/L	1	06/25/24 17:28	EPA 200.8	
MW-H(R)-061224 (A4F1203-02)				**Matrix: Water**				
Batch: 24F0813								
Arsenic	**16.7**	---	1.80	ug/L	1	06/25/24 17:33	EPA 200.8	
MW-DUP-061224 (A4F1203-03)				**Matrix: Water**				
Batch: 24F0813								
Arsenic	**17.4**	---	1.80	ug/L	1	06/25/24 17:47	EPA 200.8	

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

ANALYTICAL SAMPLE RESULTS

Dissolved Metals by EPA 200.8 (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-E(R)-061224 (A4F1203-01)				**Matrix: Water**				
Batch: 24F0812								
Arsenic	**21.2**	---	1.80	ug/L	1	06/25/24 16:37	EPA 200.8 (Diss)	
MW-H(R)-061224 (A4F1203-02)				**Matrix: Water**				
Batch: 24F0812								
Arsenic	**16.3**	---	1.80	ug/L	1	06/25/24 16:51	EPA 200.8 (Diss)	
MW-DUP-061224 (A4F1203-03)				**Matrix: Water**				
Batch: 24F0812								
Arsenic	**16.4**	---	1.80	ug/L	1	06/25/24 16:56	EPA 200.8 (Diss)	

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 200.8 (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 24F0813 - EPA 3015A												**Water**
Blank (24F0813-BLK1)			Prepared: 06/24/24 12:12 Analyzed: 06/25/24 17:05									
EPA 200.8												
Arsenic	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
LCS (24F0813-BS1)			Prepared: 06/24/24 12:12 Analyzed: 06/25/24 17:10									
EPA 200.8												
Arsenic	5.72	---	1.00	ug/L	1	5.56	---	103	85-115%	---	---	
Duplicate (24F0813-DUP1)			Prepared: 06/24/24 12:12 Analyzed: 06/25/24 17:38									
QC Source Sample: MW-H(R)-061224 (A4F1203-02)												
EPA 200.8												
Arsenic	**17.2**	---	1.80	ug/L	1	---	16.7	---	---	3	20%	
Matrix Spike (24F0813-MS1)			Prepared: 06/24/24 12:12 Analyzed: 06/25/24 17:42									
QC Source Sample: MW-H(R)-061224 (A4F1203-02)												
EPA 200.8												
Arsenic	27.1	---	1.80	ug/L	1	10.0	16.7	104	70-130%	---	---	

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 200.8 (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 24F0812 - Matrix Matched Direct Inject									Water			
Blank (24F0812-BLK1)			Prepared: 06/24/24 12:03 Analyzed: 06/25/24 16:28									
EPA 200.8 (Diss)												
Arsenic	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
LCS (24F0812-BS1)			Prepared: 06/24/24 12:03 Analyzed: 06/25/24 16:33									
EPA 200.8 (Diss)												
Arsenic	5.39	---	1.00	ug/L	1	5.56	---	97	85-115%	---	---	
Duplicate (24F0812-DUP1)			Prepared: 06/24/24 12:03 Analyzed: 06/25/24 16:42									
QC Source Sample: MW-E(R)-061224 (A4F1203-01)												
EPA 200.8 (Diss)												
Arsenic	**22.0**	---	1.80	ug/L	1	---	21.2	---	---	4	20%	
Matrix Spike (24F0812-MS1)			Prepared: 06/24/24 12:03 Analyzed: 06/25/24 16:47									
QC Source Sample: MW-E(R)-061224 (A4F1203-01)												
EPA 200.8 (Diss)												
Arsenic	32.3	---	1.80	ug/L	1	10.0	21.2	112	70-130%	---	---	

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

SAMPLE PREPARATION INFORMATION

Total Metals by EPA 200.8 (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 24F0813							
A4F1203-01	Water	EPA 200.8	06/12/24 11:05	06/24/24 12:12	25mL/50mL	45mL/50mL	1.80
A4F1203-02	Water	EPA 200.8	06/12/24 12:55	06/24/24 12:12	25mL/50mL	45mL/50mL	1.80
A4F1203-03	Water	EPA 200.8	06/12/24 12:55	06/24/24 12:12	25mL/50mL	45mL/50mL	1.80

Dissolved Metals by EPA 200.8 (ICPMS)

Prep: Matrix Matched Direct Inject

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 24F0812							
A4F1203-01	Water	EPA 200.8 (Diss)	06/12/24 11:05	06/24/24 11:44	25mL/50mL	45mL/50mL	1.80
A4F1203-02	Water	EPA 200.8 (Diss)	06/12/24 12:55	06/24/24 11:44	25mL/50mL	45mL/50mL	1.80
A4F1203-03	Water	EPA 200.8 (Diss)	06/12/24 12:55	06/24/24 11:44	25mL/50mL	45mL/50mL	1.80

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

There are No Qualifiers on Sample or QC Data for this report

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.

ND Analyte NOT DETECTED at or above the detection or reporting limit.

NR Result Not Reported

RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.

" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.

" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

Results for Volatiles analyses on soils and sediments that are reported on a “dry weight” basis include the water miscible solvent (WMS) correction referenced in the EPA 8000 Method guidance documents. Solid and Liquid samples reported on an “As Received” basis do not have the WMS correction applied, as dry weight was not performed.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) may not be included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Apex Laboratories

Philip Nerenberg, Lab Director

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Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to one half of the Reporting Limit (RL).
Blank results for gravimetric analyses are evaluated to the Reporting Level, not to half of the Reporting Level.
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.
-Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.
'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level, if results are not reported to the MDL.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Benzofluoranthene Isomer Reporting:

Due to coelutions present on the analytical column, the results reported for Benzo(b+j)fluoranthene(s) represent the concentraton of both the Benzo(b)fluoranthene and Benzo(j)fluoranthene isomers. Calibration, validation and accreditation are based on the Benzo(b)fluoranthene isomer.

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

APEX LABS
6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY

Lab # A4F1203 COC 1 of 1

Company: MFA | Project Mgr: Audrey Hackett | Project Name: Former Dunlap Mound | Project #: M0615.25.002

Address: 2815 2nd Ave Ste 540, Seattle WA | Phone: 206-556-2015 | Email: ahackett@maulfoster.com | PO # M0615.25.002

Sampled by: F. Bellows

Site Location: State WA, County Pierce

ANALYSIS REQUEST: NWTPH-HCID; NWTPH-Dx; NWTPH-Gx; 8260 BTEX; 8260 RBDM VOCs; 8260 Halo VOCs; 8260 VOCs Full List; 8270 SIM PAHs; 8270 Semi-Vols Full List; 8082 PCBs; 8081 Pesticides; RCRA Metals (8); Priority Metals (13); Al, Sb, (As), Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn — (TOTAL) (DISS) TCLP; TCLP Metals (8); Hold Sample; Frozen Archive

SAMPLE ID	DATE	TIME	MATRIX	# OF CONTAINERS	Metals (As) TOTAL/DISS
MW-E(R)-061224	6/12/24	1105	GW	2	X ①
MW-H(R)-061224	↓	1255	↓	2	X ①
MW-DUP-061224	↓	1255	↓	2	X ①

FMB 6/12/2024

Standard Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day, 2 Day, 3 Day, 5 Day, (Standard), Other: ______

SAMPLES ARE HELD FOR 30 DAYS

SPECIAL INSTRUCTIONS:
① Use EPA 200.8 w/ QQQ ICP. Potential brackish matrix.
* Dissolved fractions field-filtered.
cc: fbellows@maulfoster.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 6/12/24	Signature: [signature] Date: 6/13/24	Signature: Date:	Signature: Date:
Printed Name: Fiona Bellows Time: 1415	Printed Name: K. Burger Time: 1111	Printed Name: Time:	Printed Name: Time:
Company: MFA	Company: Apex	Company:	Company:

Form Y-002 R-00

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503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Maul Foster & Alongi, INC.	Project: **Former Dunlap Mound**	
3140 NE Broadway Street	Project Number: **M0615.25.002**	**Report ID:**
Portland, OR 97232	Project Manager: **Audrey Hackett**	**A4F1203 - 06 28 24 1116**

APEX LABS COOLER RECEIPT FORM

Client: MFA Element WO#: A4F1203

Project/Project #: Former Dunlap Mound M0615.25.002

Delivery Info:

Date/time received: 6/13/24 @ 1111 By: WAB

Delivered by: Apex__Client__ESS__FedEx X UPS__Radio__Morgan__SDS__Evergreen__Other__

From USDA Regulated Origin? Yes _____ No X

Cooler Inspection Date/time inspected: 6/13/24 @ 1111 By: WAB

Chain of Custody included? Yes X No _____

Signed/dated by client? Yes X No _____

Contains USDA Reg. Soils? Yes _____ No X Unsure (email RegSoils) _____

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	4.1						
Custody seals? (Y/N)	N						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	N						
Ice type: (Gel/Real/Other)	Real						
Condition (In/Out):	IN						

Cooler out of temp? (Y/N) Possible reason why:_____

Green dots applied to out of temperature samples? Yes (No)

Out of temperature samples form initiated? Yes (No)

Sample Inspection: Date/time inspected: 6/13/24 @ 13:23 By: KAM

All samples intact? Yes X No ___ Comments:_____

Bottle labels/COCs agree? Yes X No ___ Comments: _____

COC/container discrepancies form initiated? Yes ___ No X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments: _____

Do VOA vials have visible headspace? Yes ___ No ___ NA X

Comments_____

Water samples: pH checked: Yes X No___NA___ pH appropriate? Yes X No___NA____ pH ID: A23172

Comments: _____

2758 4717 6230

Labeled by: KAM Witness: AAN Cooler Inspected by: KAM

Form Y-003 R-02

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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Attachment C

Data Validation Memorandum

MAUL
FOSTER
ALONGI

Data Validation Memorandum

Project No. M0612.25.002 | July 2, 2024 | Port of Tacoma

Maul Foster & Alongi, Inc. (MFA), conducted an independent Stage 2A review of the quality of analytical results for groundwater and associated quality control samples collected on June 12, 2024, at the Former Dunlap Mound site located at 3009 Taylor Way, Tacoma, Washington.

Apex Laboratories, LLC (Apex), performed the analyses. MFA reviewed Apex report number A4F1203. The analysis performed and the samples analyzed are listed in the following tables.

Analysis	Reference
Total and dissolved metals	EPA 200.8

Note
EPA = U.S. Environmental Protection Agency.

Samples Analyzed		
Report A4F1203		
MW-E(R)-061224	MW-H(R)-061224	MW-DUP-061224

Data Validation Procedures

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) guidelines for data review (EPA 2020) and appropriate laboratory- and method-specific guidelines (Apex 2023, EPA 1986).

Based on the data quality assurance/quality control review described herein, the data are considered acceptable for their intended use. There are no final data qualifiers associated with the data in report A4F1203.

General Qualifications

Total and Dissolved Compounds

For report A4F1203, total and dissolved EPA Method 200.8 metals results were compared, as shown in the table below. MFA uses acceptance criterion of 20 percent relative percent difference (RPD) where dissolved metals results were greater than their associated total metals results.

Report	Sample	Analyte	Total Result (ug/L)	Dissolved Result (ug/L)	Total > Dissolved?	RPD (%)
A4F1203	MW-E(R)-061224	Arsenic	21.0	21.2	No	0.948
	MW-H(R)-061224		16.7	16.3	Yes	NC
	MW-DUP-061224		17.4	16.4	Yes	NC

Notes
NC = not calculated.
RPD = relative percent difference
ug/L = micrograms per liter.

All total metals results were greater than their associated dissolved metals results or met the RPD acceptance criterion.

Sample Conditions

Sample Custody

Sample custody was appropriately documented on the chain-of-custody form accompanying the report.

The reviewer confirmed that the gap in custody on the chain-of-custody form accompanying the report is due to shipment via a third-party service.

Holding Times

Extractions and analyses were performed within the recommended holding times.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

Sample Filtration

Field samples for dissolved EPA Method 200.8 analysis were field-filtered with a 0.45-micron filter during sample collection.

Reporting Limits

The laboratory evaluated results to method reporting limits (MRLs).

Blank Results

Method Blanks

Laboratory method blanks are used to evaluate whether laboratory contamination was introduced during sample preparation and analysis. Laboratory method blank analyses were performed at the required frequencies, in accordance with laboratory- and method-specific requirements.

All laboratory method blank results were non-detect to MRLs.

Equipment Rinsate Blanks

Equipment rinsate blanks are used to evaluate the adequacy of the field equipment decontamination process when decontaminated sampling equipment is used to collect samples.

These blanks were not required for this sampling event, as all samples were collected using dedicated or single-use equipment.

Field Filter Blanks

Field filter blanks are used to evaluate whether contamination was introduced during field filtering procedures.

Field filter blanks were not submitted for analysis. The reviewer could not evaluate whether metals contamination was introduced during field filtering procedures.

Laboratory Control Sample and Laboratory Control Sample Duplicate Results

Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) results are used to evaluate laboratory precision and accuracy. All LCSs were prepared and analyzed at the required

frequency, in accordance with laboratory- and method-specific requirements. LCSD results were not reported; laboratory precision was evaluated using laboratory duplicate results.

All LCS results were within acceptance limits for percent recovery.

Laboratory Duplicate Results

Laboratory duplicate results are used to evaluate laboratory precision and sample homogeneity. All laboratory duplicate samples were prepared and analyzed at the required frequency, in accordance with laboratory- and method-specific requirements.

Laboratory duplicate results greater than five times the MRL were evaluated using laboratory RPD control limits.

All laboratory duplicate results met the acceptance criterion.

Matrix Spike and Matrix Spike Duplicate Results

Matrix spike (MS) and matrix spike duplicate (MSD) results are used to evaluate laboratory precision, accuracy, and the effect of the sample matrix on sample preparation and target analyte recovery. All MS samples were prepared and analyzed at the required frequency, in accordance with laboratory- and method-specific requirements. MSD results were not reported; laboratory precision was evaluated using laboratory duplicate results.

All MS results were within acceptance limits for percent recovery.

Field Duplicate Results

Field duplicate results are used to evaluate field precision and sample homogeneity. The following field duplicate and parent sample pair was submitted for analysis:

Report	Parent Sample	Field Duplicate Sample
A4F1203	MW-H(R)-061224	MW-DUP-061224

MFA uses acceptance criterion of 50 percent RPD for results that are greater than five times the MRL.

All field duplicate results met the RPD acceptance criterion.

Data Package

The data package was reviewed for transcription errors, omissions, and anomalies.

None were found.

References

Apex. 2023. *Quality Systems Manual.* Rev. 11. Apex Laboratories, LLC: Tigard, OR. June 20.

EPA. 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* EPA publication SW-846. 3rd ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), VI phase III (2019), VII phase I (2019), and VII phase II (2020).

EPA. 2020. *National Functional Guidelines for Inorganic Superfund Methods Data Review.* EPA 542-R-20-006. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation: Washington, DC. November.

Attachment D

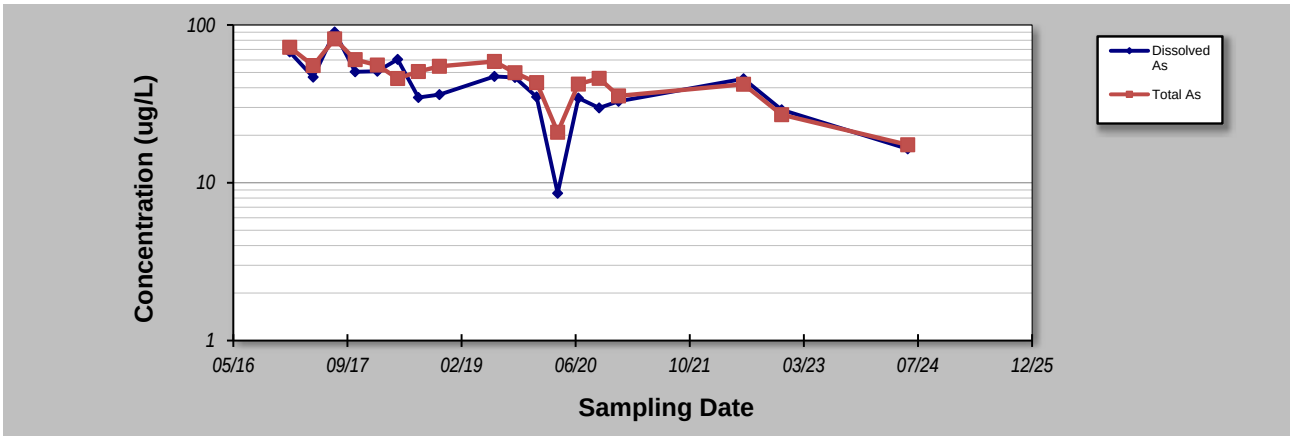
Mann-Kendall Trend Analysis and Plots

MAUL FOSTER ALONGI

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	3-Jul-24	Job ID:	M0615.25.002
Facility Name:	Former Dunlap Mound	Constituent:	Arsenic - MW-H(R)
Conducted By:	F. Bellows	Concentration Units:	ug/L

Sampling Point ID:	Dissolved As	Total As					
Sampling Event	Sampling Date	ARSENIC - MW-H(R) CONCENTRATION (ug/L)						
1	1/12/2017	67.5	72.2					
2	4/25/2017	46.7	55.3					
3	7/28/2017	90.2	81.6					
4	10/26/2017	50.5	60.3					
5	1/31/2018	50.9	55.7					
6	4/30/2018	60.5	45.8					
7	7/30/2018	34.7	50.7					
8	10/30/2018	36.2	54.7					
9	6/28/2019	47.2	58.7					
10	9/26/2019	46.5	49.8					
11	12/30/2019	35	43.1					
12	3/31/2020	8.58	20.9					
13	6/30/2020	34.4	42.2					
14	9/29/2020	29.8	45.9					
15	12/23/2020	32.8	35.5					
16	6/23/2022	45.6	42.1					
17	12/7/2022	29	27					
18	6/12/2024	16.4	17.4					
19								
20								
Coefficient of Variation:		0.44	0.34					
Mann-Kendall Statistic (S):		-97	-109					
Confidence Factor:		>99.9%	>99.9%					
Concentration Trend:		Decreasing	Decreasing					



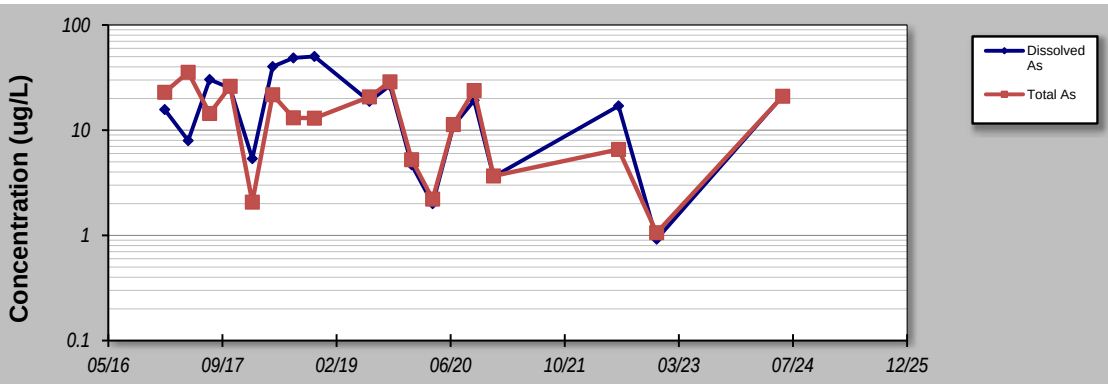
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	3-Jul-24	Job ID:	M0615.25.002
Facility Name:	Former Dunlap Mound	Constituent:	Arsenic - MW-E(R)
Conducted By:	F. Bellows	Concentration Units:	ug/L

Sampling Point ID:	Dissolved As	Total As					
Sampling Event	Sampling Date	ARSENIC - MW-E(R) CONCENTRATION (ug/L)						
1	1/12/2017	15.7	22.9					
2	4/25/2017	7.96	35.5					
3	7/28/2017	30.3	14.4					
4	10/26/2017	25.1	26.1					
5	1/31/2018	5.36	2.07					
6	4/30/2018	40.2	21.7					
7	7/30/2018	48.6	13.1					
8	10/30/2018	50.2	13					
9	6/28/2019	18.8	20.7					
10	9/26/2019	26.6	28.8					
11	12/30/2019	4.69	5.24					
12	3/31/2020	2	2.21					
13	6/30/2020	11	11.3					
14	9/29/2020	19.2	23.8					
15	12/23/2020	3.61	3.67					
16	6/23/2022	17	6.56					
17	12/7/2022	0.92	1.06					
18	6/12/2024	21.2	21.0					
19								
20								
Coefficient of Variation:		0.79	0.68					
Mann-Kendall Statistic (S):		-33	-51					
Confidence Factor:		88.5%	97.1%					
Concentration Trend:		Stable	Decreasing					



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.